Amendments to the Drawings

Formal drawings are submitted herewith wherein Figures 3 and 4 are relabeled.

Title: IMAGE PROCESSING FOR CLUSTERING RELATED TEXT OBJECTS
Inventor(s): Robert Edward Meredith SWANN, et al.
Serial No.: 09/724 182
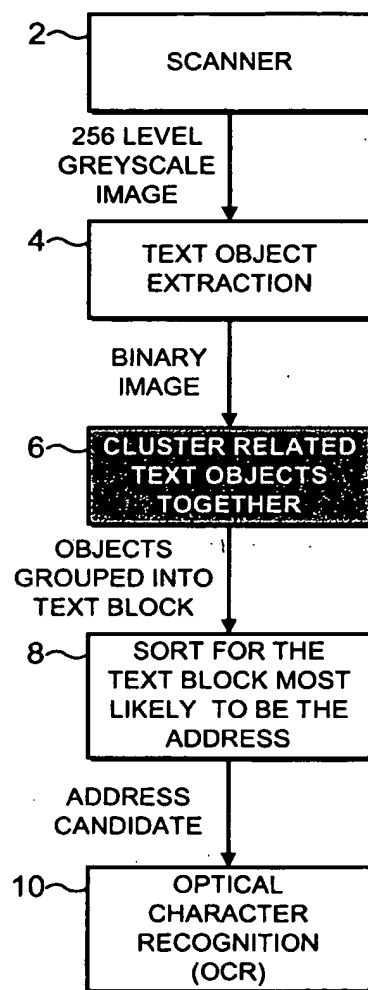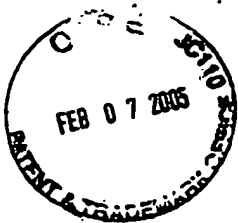Docket No.: R&G C-314

Replacement Sheet

1 / 5

```
         ┌─────────────────────┐
    2 ~  │      SCANNER        │
         └─────────────────────┘
                    │
              256 LEVEL
              GREYSCALE
               IMAGE
                    ▼
         ┌─────────────────────┐
    4 ~  │   TEXT OBJECT       │
         │   EXTRACTION        │
         └─────────────────────┘
                    │
               BINARY
                IMAGE
                    ▼
         ┌─────────────────────┐
    6 ~  │ CLUSTER RELATED     │
         │ TEXT OBJECTS        │
         │ TOGETHER            │
         └─────────────────────┘
                    │
              OBJECTS
          GROUPED INTO
           TEXT BLOCK
                    ▼
         ┌─────────────────────┐
    8 ~  │ SORT FOR THE        │
         │ TEXT BLOCK MOST     │
         │ LIKELY TO BE THE    │
         │ ADDRESS             │
         └─────────────────────┘
                    │
              ADDRESS
             CANDIDATE
                    ▼
         ┌─────────────────────┐
   10 ~  │   OPTICAL           │
         │   CHARACTER         │
         │   RECOGNITION       │
         │   (OCR)             │
         └─────────────────────┘
```
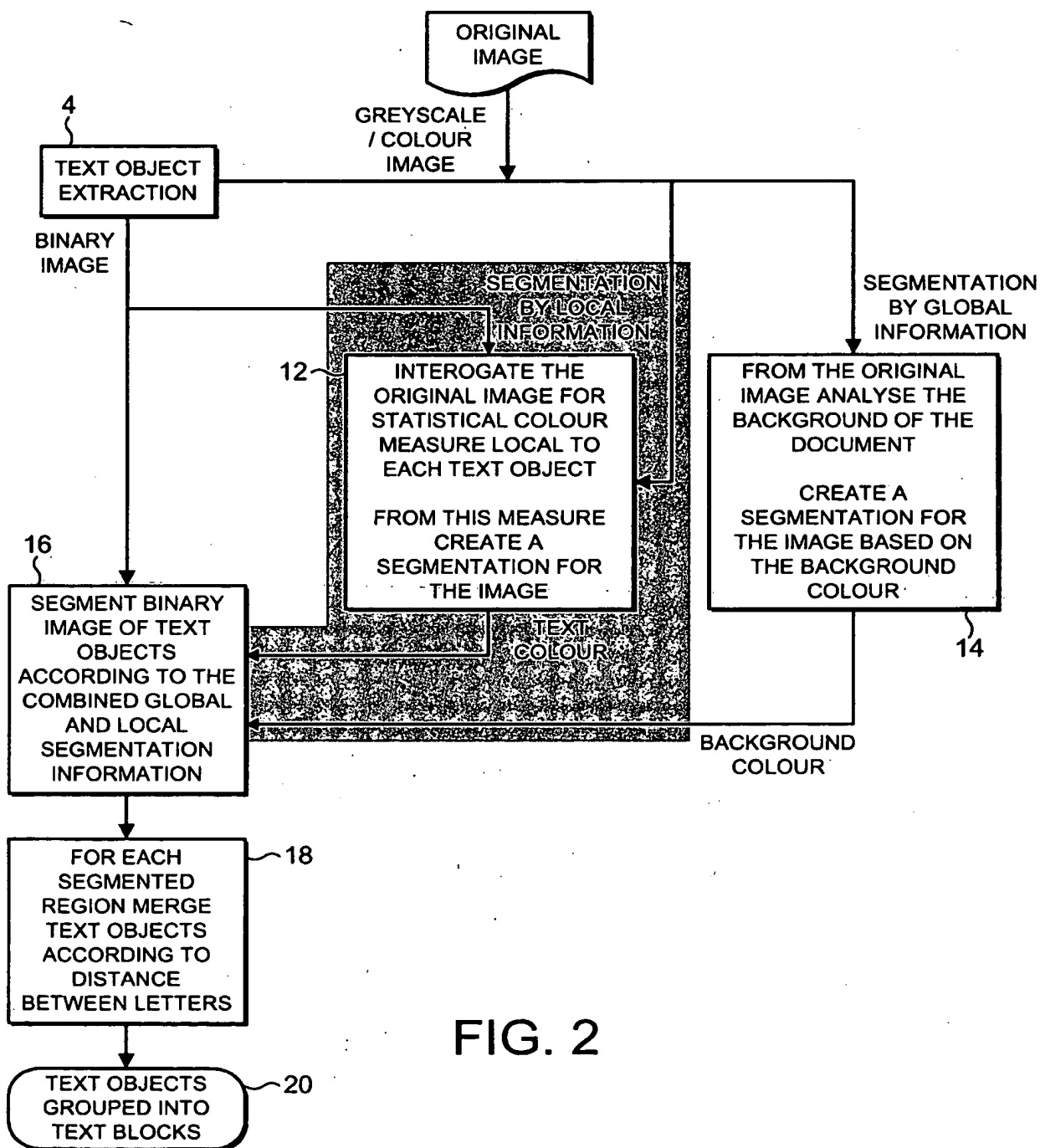
FIG. 1

Title: IMAGE PROCESSING FOR CLUSTERING RELATED TEXT OBJECTS
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Docket No.: R&G C-314

Replacement Sheet

2 / 5

ORIGINAL IMAGE

4

TEXT OBJECT EXTRACTION

GREYSCALE / COLOUR IMAGE

BINARY IMAGE

SEGMENTATION BY LOCAL INFORMATION

SEGMENTATION BY GLOBAL INFORMATION

12
INTEROGATE THE ORIGINAL IMAGE FOR STATISTICAL COLOUR MEASURE LOCAL TO EACH TEXT OBJECT

FROM THIS MEASURE CREATE A SEGMENTATION FOR THE IMAGE

FROM THE ORIGINAL IMAGE ANALYSE THE BACKGROUND OF THE DOCUMENT

CREATE A SEGMENTATION FOR THE IMAGE BASED ON THE BACKGROUND COLOUR

14

TEXT COLOUR

16
SEGMENT BINARY IMAGE OF TEXT OBJECTS ACCORDING TO THE COMBINED GLOBAL AND LOCAL SEGMENTATION INFORMATION

BACKGROUND COLOUR

FOR EACH SEGMENTED REGION MERGE TEXT OBJECTS ACCORDING TO DISTANCE BETWEEN LETTERS **18**

FIG. 2

TEXT OBJECTS GROUPED INTO TEXT BLOCKS **20**

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Serial No.: 09/724 182
Docket No.: R&G C-314

Replacement Sheet

3 / 5

A) ORIGINAL DOCUMENT IMAGE

FIG. 3A

B) EXTRACTED BINARY TEXT OBJECTS
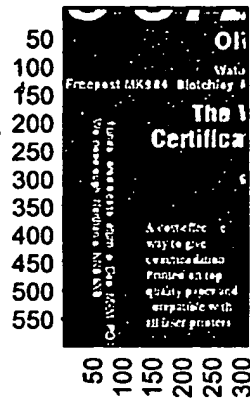
FIG. 3B

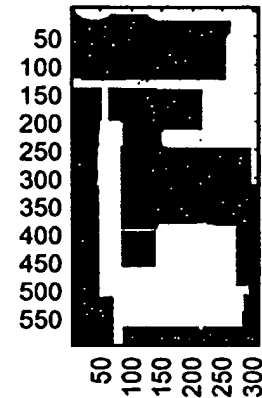**C) CLUSTERING USING SIMPLE MERGING. ALL TEXT OBJECTS ARE CLUSTERED TOGETHER**

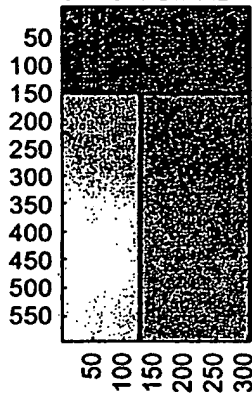

FIG. 3C

D) EXTRACT BACKGROUND FROM ORIGINAL

FIG. 3D

E) SEGMENT ACCORDING TO BACKGROUND. FOR EACH BACKGROUND REGION SEPARATELY APPLY MERGING TO THE TEXT OBJECTS
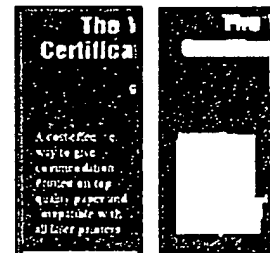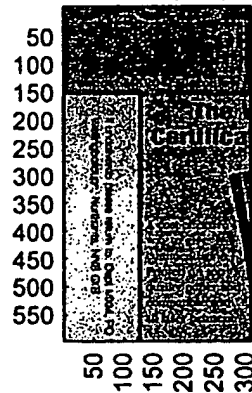

FIG. 3E

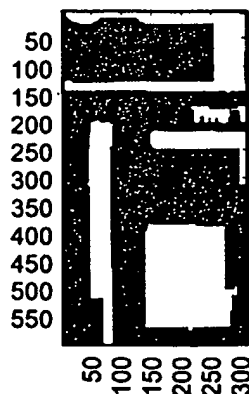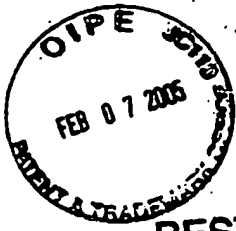**F) THE RESULTS ARE CLUSTERED TEXT OBJECTS THAT HAVE CONSISTENT BACKGROUND**

FIG. 3F

Title: IMAGE PROCESSING FOR CLUSTERING RELATED TEXT OBJECTS
Inventor(s): Robert Edward Meredith SWANN, et al.
Serial No.: 09/724 182
Docket No.: R&G C-314

Replacement Sheet

4 / 5

ORIGINAL
DOCUMENT IMAGE
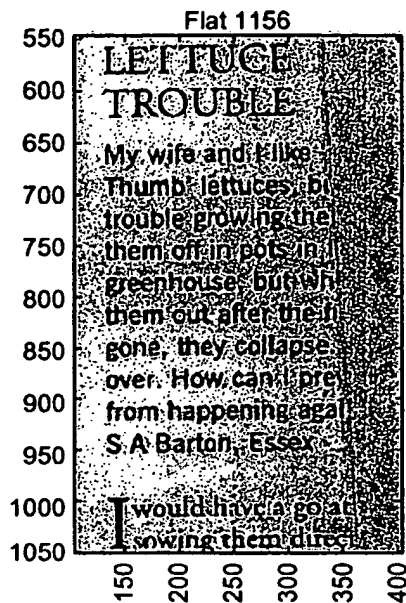
FOR EACH OF THE BINARY TEXT OBJECTS
EXTRACTED THE LOCAL MINIMUM GREYLEVEL
IS OBTAINED FROM THE ORIGINAL IMAGE.
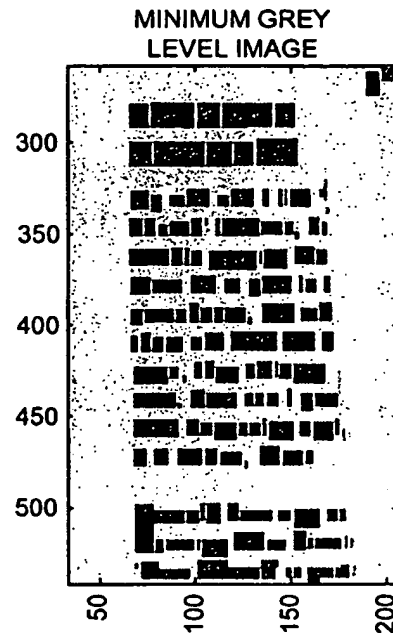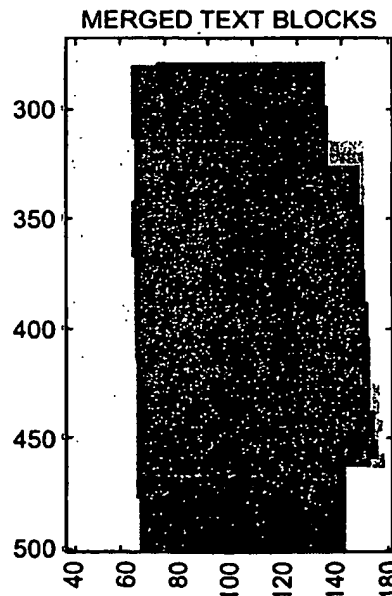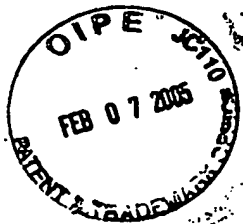THE LOCAL MINIMUM GREYLEVEL IS A
MEASURE OF THE TEXT COLOUR

FIG. 4A

FIG. 4B

THE MINIMUM GREYLEVEL DATA IS USED TO
BUILD A SEGMENTATION OF THE IMAGE. EACH
REGION IN SEGMENTATION IS AN AREA OF
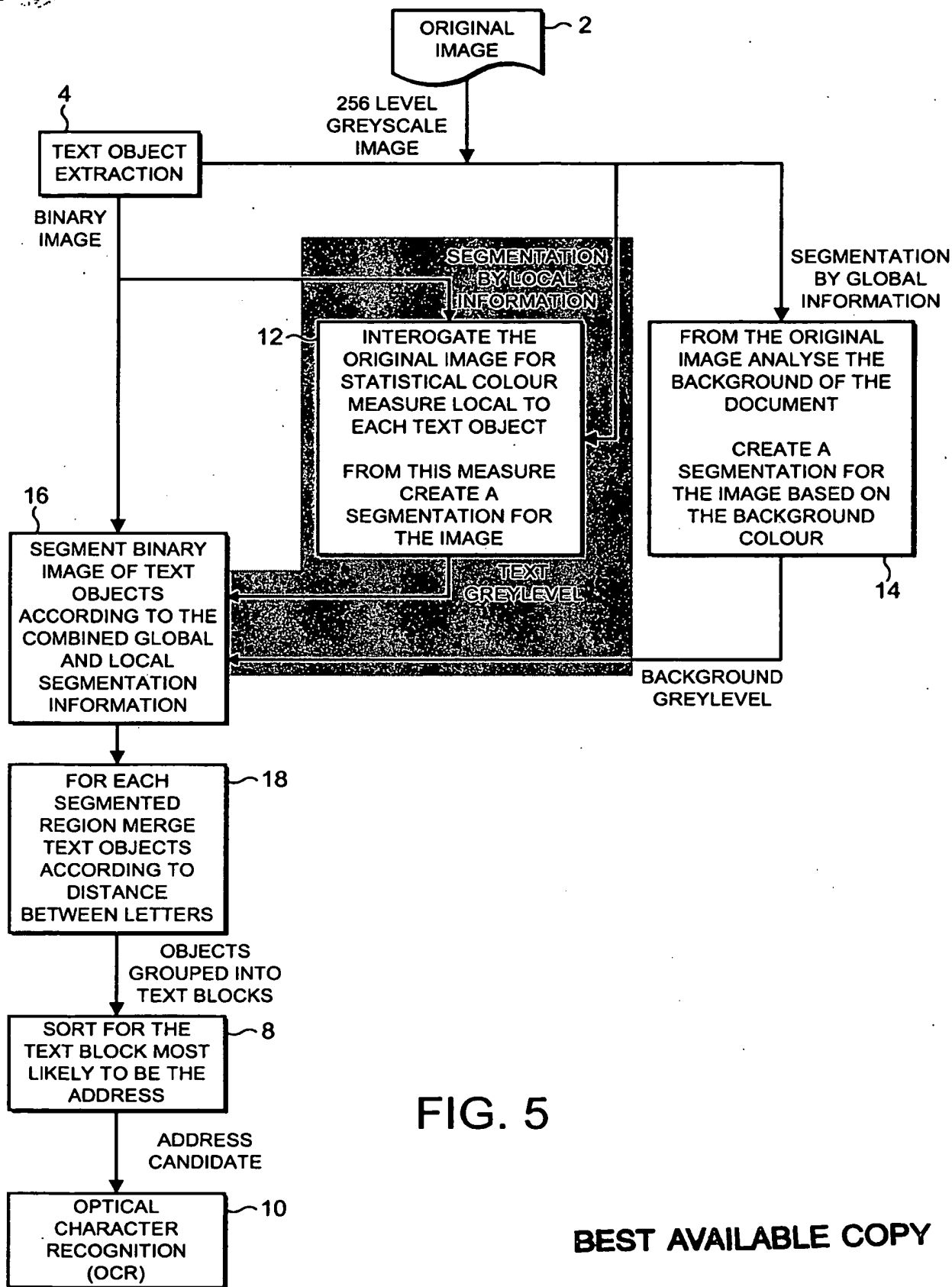THE IMAGE WHERE THE TEXT COLOUR IS
CONSISTENT.

FIG. 4C

Title: IMAGE PROCESSING FOR CLUSTERING RELATED TEXT OBJECTS
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Serial No.: 09/724 182
Docket No.: R&G C-314

Replacement Sheet

5 / 5

ORIGINAL IMAGE ~ 2

256 LEVEL GREYSCALE IMAGE

4

TEXT OBJECT EXTRACTION

BINARY IMAGE

SEGMENTATION BY LOCAL INFORMATION

SEGMENTATION BY GLOBAL INFORMATION

12 — INTEROGATE THE ORIGINAL IMAGE FOR STATISTICAL COLOUR MEASURE LOCAL TO EACH TEXT OBJECT

FROM THIS MEASURE CREATE A SEGMENTATION FOR THE IMAGE

FROM THE ORIGINAL IMAGE ANALYSE THE BACKGROUND OF THE DOCUMENT

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14

TEXT GREYLEVEL

16

SEGMENT BINARY IMAGE OF TEXT OBJECTS ACCORDING TO THE COMBINED GLOBAL AND LOCAL SEGMENTATION INFORMATION

BACKGROUND GREYLEVEL

FOR EACH SEGMENTED REGION MERGE TEXT OBJECTS ACCORDING TO DISTANCE BETWEEN LETTERS ~18

OBJECTS GROUPED INTO TEXT BLOCKS

SORT FOR THE TEXT BLOCK MOST LIKELY TO BE THE ADDRESS ~8

FIG. 5

ADDRESS CANDIDATE

OPTICAL CHARACTER RECOGNITION (OCR) ~10

BEST AVAILABLE COPY